

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant : Bailey, et al. Art Unit : 1722
Serial No. : 10/666,527 Examiner : E. Luk
Filed : September 18, 2003 Conf. No. : 5895
Title : IMPRINT LITHOGRAPHY TEMPLATES HAVING ALIGNMENT MARKS

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Commissioner for Patents
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SUPPLEMENTAL BRIEF ON APPEAL

I. REAL PARTY-IN-INTEREST

The real party in interest is The Board of Regents, The University of Texas System, who is the assignee of the entire right and interest in the present Application.

II. RELATED APPEALS AND INTERFERENCES

There are no appeals or interferences known to Appellants, the Appellants' legal representative, or assignee which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

III. STATUS OF CLAIMS

Claims 1-20 are pending in the Application.

Claims 1-20 stand rejected and are on appeal in this Supplemental Brief on Appeal.

IV. STATUS OF AMENDMENTS

There were no amendments to the claims or Specification filed after the Final Rejection.

V. SUMMARY OF CLAIMED SUBJECT MATTER

Claim 1 recites an imprint template for imprint lithography that comprises alignment marks embedded in an embedding material included in bulk material of the imprint template, wherein the embedding material surrounds the alignment marks. Imprint lithography technologies utilize a step-and-repeat process in which a pattern on a mold or imprint template is recorded on a plurality of regions on the substrate. [0011]. As such, execution of a step-and-repeat process requires proper alignment of the mold or imprint template with each of these regions. [0011]. Hence, a mold or imprint template typically includes alignment marks that are aligned with complimentary marks on the substrate. [0011]. To carry out alignment, a sensor couples to the alignment marks on the mold or imprint template and the marks on the substrate to provide an alignment signal that is used to step the mold or imprint template across the substrate. [0011]. Alignment marks may generate a moire alignment pattern for use in optical detection of alignment to position the mold or imprint temple relative to the substrate. [0012]. Another method of alignment has the alignment marks on the mold or imprint template and the substrate may comprise plates of a capacitor such that the sensor detects a capacitance between the marks. [0012]. The alignment marks are embedded in the imprint template and are fabricated from a material whose index of refraction is different from that of at least the bulk material of the imprint template surrounding the alignment marks. [0029]. A distance between a surface of the imprint template and the alignment marks is large enough to enable the radiation utilized to polymerize the material to defract around the alignment marks and polymerize material disposed thereunder. [0029]. Further, embedding the alignment marks enables the curing radiation to cure the material directly thereunder. [0030]. Figures 3A-3F illustrate a step-by-step sequence for fabricating alignment marks in an imprint template. [0031]. The alignment marks 405 and 406 are at a distance from a surface of imprint templates 420 and 421 that is large enough to enable radiation utilized to polymerize a material in a particular application to defract around the alignment marks and polymerize material disposed there under. [0033]. Figure 3F shows the alignment marks embedded within the imprint template. [0034].

Independent claim 11 recites these features of the imprint template in a similar manner as in claim 1. Claim 19 recites a process for fabricating an imprint template, which is covered by Figures 3A-3F described within paragraphs [0031]-[0034].

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

1. Claims 1-7 and 11-15 stand rejected under 35 U.S.C. §102(b) as being anticipated by *Mancini* (U.S. Patent No. 6,387,787) in view of *Lof* (U.S. Published Patent Application No. 2003/0224262).

2. Claims 8, 16, and 19-20 stand rejected under 35 U.S.C. §103(a) as being unpatentable over *Mancini* in view of *Lof* and *Calvey* (U.S. Patent No. 6,165,911).

3. Claims 9-10 and 17-18 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over *Mancini* in view of *Lof* and *Caveley* and further in view of *Jeans* (U.S. Published Patent Application No. 2004/0219246).

VII. ARGUMENTS

1. Claims 1-7 and 11-15 stand rejected under 35 U.S.C. §102(b) as being anticipated by *Mancini* (U.S. Patent No. 6,387,787) in view of *Lof* (U.S. Published Patent Application No. 2003/0224262). In response, Applicants traverse this rejection. For a claim to be anticipated under §102, each and every element of the claim must be found within the cited prior art reference.

Claim 1 recites an imprint template for imprint lithography. Such an imprint template is recited within the body of claim 1. The Examiner asserts that *Mancini* teaches the alignment marks as surface 22. Surface 22 is not an alignment mark or layer; it is just a surface of layer 20. Alignment marks are described in [0011], with their use described in [0012]. The Examiner cannot ignore the meaning of alignment marks when attempting to find a reference that teaches all of the limitations of claim 1. *Mancini* does not teach or suggest that layer 20 or surface 22 in any way performs an alignment function as do the alignment marks recited within the present

invention. An examiner may broadly interpret claim limitations, but such interpretation must be reasonable and consistent with the teachings of the specification. A claim term is generally given the ordinary and customary meaning that the term would have to a person of ordinary skill in the art in question at the time of the invention. *See, Phillips v. AWH Corp.*, 415 F.3d 1303, 1314 (Fed. Cir. 2005) (en banc). In construing a claim term, the “person of ordinary skill in the art is deemed to read the claim term ... in the context of the entire patent, including the specification.” *Id.* Thus, the specification is “the primary basis for construing the claims.” *Id.* at 1315. During prosecution, the Office gives claims their broadest reasonable construction “in light of the specification as it would be interpreted by one of ordinary skill in the art.” *Id.* At 1316. The interpretation used by the Office, however, must be reasonable; “Claims are not to be read in a vacuum and while it is true they are to be given the broadest, reasonable interpretation during prosecution, their terms still have to be given the meaning called for by the specification of which they form a part.” *In re Royka*, 490 F.2d 981, 984 (CCPA 1974). See also MPEP §2111. Since the Examiner’s *prima facie* case of obviousness depends upon the Examiner’s assertions of what *Mancini* teaches and discloses, and since Applicants have rebutted such assertions by the Examiner, the Examiner’s *prima facie* case of obviousness fails. An applicant may specifically challenge an obviousness rejection by showing that the Examiner reached an incorrect conclusion of obviousness or that the Examiner based the obviousness determination on incorrect factual predicates. *In re Rouffet*, 47 USPQ 2d 1453, 1455 (Fed. Cir. 1998).

The present invention as recited in claim 1 recites alignment marks for use in imprint lithography within an imprint template, wherein the alignment marks are embedded. *Lof* may teach alignment marks, but *Lof* has nothing to do with imprint lithography. *Mancini* is an invention directed at imprint lithography, but there is no teaching or even a mirror suggestion within *Mancini* of the use of alignment marks, contrary to the Examiner’s assertions. The Examiner has recognized this, and has relied upon the Examiner’s unreasonably broad interpretation of the teachings of *Mancini* in an attempt to find a disclosure of alignment marks in *Mancini* so that the Examiner can assert that one skilled in the art at the time the invention was made would have combined the two references in order to arrive at the claimed invention.

Applicants have more than adequately rebutted the assertion by the Examiner that *Mancini* teaches alignment marks. As a result, one skilled in the art at the time the invention was made would not have looked at *Mancini* and *Lof* and combined them in order to arrive at the claimed invention, because there is no suggestion to combine the two references to arrive at an invention of alignment marks embedded within an imprint template.

Claim 2 recites that the alignment marks are spaced one or more predetermined distances from a surface of the imprint template. The Examiner has not specifically addressed such claim limitations and has therefore failed to prove a *prima facie* case of obviousness in rejecting claim 2. Even if *Lof* teaches alignment marks embedded in a material, *Lof* has nothing to do with an imprint template, and therefore the combination of the references does not teach or suggest the limitations of claim 2.

Claim 3 recites that the one or more predetermined distances is sufficient to enable predetermined radiation to irradiate predetermined regions disposed under a surface of the imprint template. There is no discussion in either of the references of irradiation under a surface of an imprint template. Space 25 recited in *Mancini* does not meet such claims limitations, nor does *Mancini* recite an imprint template nor a need to irradiate regions under the surface of such an imprint template. As a result, the Examiner has failed to prove a *prima facie* case of obviousness in rejecting claim 3.

Claim 4 recites that the alignment marks are fabricated from a material whose index of refraction is different from that of at least the embedding material. The Examiner is relying upon teachings in Mancini for supporting the obviousness rejection. Since *Mancini* does not teach or suggest alignment marks, the Examiner has not adequately shown how the combination of references discloses the limitation of claim 4 or makes them obvious. Id.

Claim 5 recites that the alignment marks are fabricated from a material whose index of refraction is different from that of at least the embedding material and that of a material into which an imprint is made. The Examiner has not specifically addressed these claim limitations. For this reason alone, the Examiner has failed to prove a *prima facie* case of obviousness in rejecting claim 5. Furthermore, for reasons similarly given above with respect to claim 4, since

Mancini does not teach or suggest alignment marks, the Examiner has not adequately shown how the combination of references discloses these claim limitations. Further, there is no teaching or suggestion within *Mancini* or *Lof* that the index of refraction of the material from which the alignment marks are fabricated is different from a material into which an imprint is made.

With respect to claim 6, the Examiner has asserted that surface 22 may include a metal. However, since surface 22 is not an alignment mark, the Examiner has failed to prove a *prima facie* case of obviousness, since *Mancini* does not meet the teachings that the Examiner needs in order for the obviousness rejection to be valid. *Id.*

Claim 7 recites that a material disposed between the alignment marks and a surface of the imprint template is the same material as the embedding material and is the same material used to form other portions of the bulk material of the imprint template. Since the Examiner has not in any way specifically addressed these claim limitations, the Examiner has failed to prove a *prima facie* case of obviousness in rejecting claim 7.

With respect to claim 11, it is patentable for similar reasons as given above with respect to claim 1. Furthermore, claim 11 recites that the bulk material is transparent to radiation having a predetermined wavelength. The Examiner has not in any way addressed this claim limitation. For this reason alone, claim 11 is patentable over the cited prior art, since the Examiner has failed to prove a *prima facie* case of obviousness in rejecting claim 11. Claim 11 is also patentable for similar reasons as given above with respect to claim 2.

Claim 12 is patentable for similar reasons as given above with respect to claim 3.

Claim 13 is patentable for similar reasons as given above with respect to claim 4.

Claim 14 is patentable for similar reasons as given above with respect to claim 5.

Claim 15 is patentable for similar reasons as given above with respect to claim 6.

2. Claims 8, 16, and 19-20 stand rejected under 35 U.S.C. §103(a) as being unpatentable over *Mancini* in view of *Lof* and *Calveley* (U.S. Patent No. 6,165,911). In response, Applicants respectfully traverse these rejections. These claims are dependent upon allowable claims argued above.

The Examiner asserts that *Mancini* fails to teach a release layer.

However, the Examiner asserts that "Calveley teaches the use of a release material layer with the stamp during the process (col. 7, line 53)" and that it would have been obvious to one of ordinary skill in the art to modify *Mancini* with the addition of a release layer as taught by *Calveley*.

With respect to claims 8 and 16, in response, as asserted above, Applicants respectfully assert that because *Mancini* fails to teach "alignment marks embedded in an embedding material included in bulk material of the imprint template, wherein said embedding material surrounds said alignment marks" as recited in independent claims 1 and 11, from which claims 8 and 16 respectively depend, dependent claims 8 and 16 are not rendered obvious by *Mancini* in view of *Lof* and *Calveley*.

With respect to independent claim 19, *Mancini* neither discloses nor renders obvious covering either patterning layer 20 or surface 22 with the same material used to fabricate substrate 12. Further, *Calveley* does not disclose covering contrast pattern 16 with the same material used to fabricate substrate 14.

The Examiner seems to be asserting that the Examiner is relying upon *Mancini* for teaching the use of a mask in creating the imprint template. Applicants traverse, since Applicants have already shown how alignment marks are not in any way taught or suggested within *Mancini*. Therefore, etching alignment features through the mask into the imprint template is not in any way taught or suggested within *Mancini*, nor is depositing alignment marks into the alignment features. Essentially, the Examiner has not described how the combination of references teaches or suggests each of the steps of depositing a mask on an imprint template, etching the alignment features through the mask, and then depositing alignment marks. For this reason alone, the Examiner has failed to prove a *prima facie* case of obviousness in rejecting claim 19. In rejecting a claim, the Examiner must address each and every limitation within the claim. In rejecting claim 19, the Examiner has not done so.

Further, Applicants respectfully assert that dependent claim 20, with its limitations, is likewise not rendered obvious by *Mancini* in view of *Lof* and *Calveley*. The Examiner has not in

any way addressed the limitations of claim 20. For this reason alone, the Examiner has failed to prove a *prima facie* case of obviousness in rejecting claim 20.

3. Claims 9, 10, 17, and 18 stand rejected under 35 U.S.C. 103(a) as being unpatentable over *Mancini* in view of *Lof* and *Calveley* as applied to claims 8 and 16 above and further in view of *Jeans* (2004/0219246). Applicants respectfully traverse.

The Examiner asserted that *Mancini* fails to teach fluorocarbons.

Further, the Examiner asserted that *Jeans* teaches the use of fluorcarbons as a release layer.

Applicants respectfully assert that because claims 8 and 16, which depend from amended independent claims 1 and 11, respectively, are patentable over *Mancini* in view of *Calveley*, for the reasons described above, the Examiner's assertion is moot. Thus, Applicants respectfully assert that claims 9, 10, 17, and 18 are patentable over *Mancini* in view of *Lof* and *Calveley* and further in view of *Jeans*.

As a result of the foregoing, Applicants respectfully assert that the Examiner has failed to prove a *prima facie* case of obviousness in rejecting claims 1-20.

Please apply any necessary charges or credits to Deposit Account No. 06-1050.

Respectfully submitted,


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CLAIMS APPENDIX

1. An imprint template for imprint lithography that comprises:
alignment marks embedded in an embedding material included in bulk material of
the imprint template, wherein the embedding material surrounds the alignment marks.
2. The imprint template of claim 1 wherein one or more of the alignment marks are
spaced one or more predetermined distances from a surface of the imprint template.
3. The imprint template of claim 1 wherein the one or more predetermined distances
is sufficient to enable predetermined radiation to irradiate predetermined regions disposed under
a surface of the imprint template.
4. The imprint template of claim 1 wherein the alignment marks are fabricated from
a material whose index of refraction is different from that of at least the embedding material.
5. The imprint template of claim 1 wherein the alignment marks are fabricated from
a material whose index of refraction is different from that of at least the embedding material and
that of a material into which an imprint is made.
6. The imprint template of claim 1 wherein the alignment marks are metal.
7. The imprint template of claim 1 wherein a material disposed between the
alignments marks and a surface of the imprint template is the same material as the embedding
material and is the same material used to form other portions of the bulk material of the imprint
template.
8. The imprint template of claim 1 wherein the surface of the imprint template
includes a release layer.
9. The imprint template of claim 8 wherein the release layer is a fluorocarbon
release layer.
10. The imprint template of claim 8 wherein the release layer is a covalently bonded,
thin, fluorocarbon film.
11. An imprint template for imprint lithography that comprises:
alignment marks embedded in an embedding material included in bulk material of
the imprint template, wherein said embedding material surrounds said alignment marks, with
said bulk material being transparent to radiation having a predetermined wavelength and said

alignment marks being spaced one or more predetermined distances from a surface of the imprint template.

12. The imprint template of claim 11 wherein the one or more predetermined distances is sufficient to enable said radiation to irradiate predetermined regions in superimposition with the imprint template.

13. The imprint template of claim 12 wherein the alignment marks are fabricated from a material whose index of refraction is different from that of at least the embedding material.

14. The imprint template of claim 13 wherein the index of refraction of the material differs from an index of refraction a layer into which an imprint is made.

15. The imprint template of claim 14 wherein the alignment marks are metal.

16. The imprint template of claim 15 wherein the surface of the imprint template includes a release layer.

17. The imprint template of claim 16 wherein the release layer is a fluorocarbon release layer.

18. The imprint template of claim 16 wherein the release layer is a covalently bonded, thin, fluorocarbon film.

19. A method for fabricating an imprint template for imprint lithography that comprises steps of:
depositing a mask on an imprint template;
etching alignment features through the mask into the imprint template;
depositing alignment marks into the alignment features;
over covering the alignment marks with a same material used to fabricate the imprint template; and
removing the mask.

20. The method of claim 19 which further comprises treating the surface of the imprint template.

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EVIDENCE APPENDIX

No evidence was submitted pursuant to §§1.130, 1.131, or 1.132 of 37 C.F.R. or of any other evidence entered by the Examiner and relied upon by Appellants in the Appeal.

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RELATED PROCEEDINGS APPENDIX

None.